



# GC3: Year in Review May 2014

## GC3 Accomplishments 2013-2014

- A new look and focus for the GC3
- Growth in numbers and diversity of firms
- 12 Webinars in four webinar series: Education, Innovation, Mainstreaming, and Retail
- Significant work in project groups
- Number of presentations, reference in articles, and publications
- First GC3 Networking event at GreenBuild
- Planning and engagement for this year's 9<sup>th</sup> annual roundtable



**GREEN CHEMISTRY & COMMERCE COUNCIL**

Business Mainstreaming Green Chemistry

IMAGE PROVIDED BY GC3 MEMBER SHAW INDUSTRIES

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The Green Chemistry & Commerce Council is a cross sectoral, business-to-business network of companies and other organizations working collaboratively to advance green chemistry across sectors and supply chains.



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GC3 members engage in cutting edge, collaborative projects to develop and pilot tools, educational programs, and business practices that address common challenges and support green chemistry adoption in their businesses.

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Welcome Solazyme to the GC3! Solazyme is unlocking the power of microalgae to create sustainable solutions to some of the world's biggest challenges. Through its breakthrough technology platform, Solazyme transforms renewable feedstocks into high-value oils, powerhouse food ingredients and other microalgae-derived products. These sustainable

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# Mainstreaming Green Chemistry: A GC3 Focus

What do we mean by “mainstreaming?”

Green chemistry becomes standard practice throughout the economy so that all chemistry is, by default, green chemistry

# Mainstreaming Green Chemistry: A GC3 Focus

## Why mainstreaming?

Despite significant successes in programs, collaborations and recognition of need, it's still a marginal consideration

The green chemistry community lacks a coherent long term strategy, strong coordination, and significant, stable funding.

# Mainstreaming Green Chemistry: A GC3 Focus

## Questions to ask:

What would an agenda to advance green chemistry research, education and adoption look like?

What partnerships are needed?

What role should the GC3 play in facilitating and advancing this agenda?

What “big ideas” can we pursue over the coming 5-7 years?

## Mainstreaming Green Chemistry: Why is the GC3 Uniquely Positioned

- Business-to-business focus
- Members are from many sectors and multiple points in the value chain
- Focus on pragmatic solutions through collaborative projects
- Green Chemistry lens
- Ability to connect multiple stakeholder groups
- **Members represent \$600bn in revenue and over 1.6 million employees and research, manufacturing or headquarters operation 22 states**

***GC3 Green Chemistry Innovation Webinar Series***



December 12, 2013

**Advancing Green Chemistry Innovation in the Pharmaceutical Industry:  
The GCI Pharmaceutical Roundtable's Research Grant Program**



Julie Manley, Guiding Green LLC & Coordinator of the ACS,  
Green Chemistry Institute's Pharmaceutical Roundtable







## State Perspectives on Promoting Green Chemistry



Alister Innes, Green Chemistry Coordinator,  
Minnesota Pollution Control Agency



Mark Brady, Clean Technology Strategist,  
Business Oregon

## GC3 Retail Webinar Series

**The Coop Story: How a leading Danish Retailer is working to eliminate endocrine disrupting chemicals from its products**



**Wednesday April 30, 2014,  
1pm Eastern/10am Pacific  
Free for all attendees!**

Malene Teller Blume, Compliance Manager for non-food products at Coop, will discuss how her organization has worked to eliminate endocrine disrupting chemicals from its private label products, beginning with parabens in 2006 and including other chemicals, such as BPA, since 2009. Coop has also executed other actions to reduce harmful chemicals. Coop is Denmark's leading retailer, with about 1,200 supermarkets and 36,000 employees. Coop is owned by its members, who want to see a financial return and want their company to be socially responsible. Malene Blume will discuss her organization's policy on chemicals, the impact the decision has made on sales, and the way consumers perceive their products. Coop's stance is that consumers should be given the ability to make an informed choice about the products they buy.

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### Green Chemistry – Making that fresh coat of paint safer

2013 DECEMBER 3



**Jim Jones**  
December 3, 2013  
10:00 am EDT



One of the most exciting parts of my job is learning about technologies by American innovators and researchers that are solving some of our most pressing environmental problems. These discoveries are bringing us safer chemicals, reducing hazardous waste, energy and water, and improving the bottom line for America's manufacturing sector.

Did you know that one of the ways we traditionally make paint can use up tremendous amounts of energy, water, and chemicals in the manufacturing process, as well as being costly? Scientists have recently found a technology that can help solve this problem – and I recently visited the facility where it's happening.

Two weeks ago, I took a side trip while at the 2013 U.S. Green Build Expo and [Green Chemistry Networking](#) in Philadelphia to learn about this new technology at Dow's Chemical facility in Collegeville, PA. When I travel for EPA, I try to visit facilities where Green Chemistry technologies are being developed and used. Dow's technology greatly

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PHOTOS OF THE DAY



Home > Volume 92 Issue 7 > Walmart And Target Take Aim At Hazardous Ingredients



Volume 92 Issue 7 | pp. 19-21  
Issue Date: February 17, 2014

## Walmart And Target Take Aim At Hazardous Ingredients

Big retailers formulate policies to regulate the chemicals that go into the products they sell

By [Melody M. Bomgardner](#)

Department: [Business](#) | Collection: [Sustainability, Safety](#)

News Channels: [Environmental SCENE](#)

Keywords: [sustainability](#), [consumer products](#), [toxic chemicals](#), [green chemistry](#), [soaps and detergents](#), [personal care](#)

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### MESSAGE DELIVERED

Medfield, Mass., sixth-graders bring signatures supporting safer cosmetics to a Target store manager.

Credit: Cheryl Durr Patsy

Megaretailers [Walmart](#) and [Target](#) announced last fall that they would reduce or eliminate ingredients in household goods that they deem harmful to human health and the environment. The policies, which focus on cleaners and personal care products, were applauded by advocacy groups that are pushing companies to disclose ingredients and apply more stringent safety criteria than required by law.

In the months since the announcements, both companies have gone silent about the policies. Neither Walmart nor Target agreed to speak with C&EN for this story. But interviews with executives and advocates who have worked with the firms on their strategies make it clear that the programs are still works in progress.

Although both retailers devised their approaches to respond to pressure from consumers, that is not the only driver, experts say. "The retail regulation you are seeing is a direct response to the failure of government to directly regulate those chemicals," says Martin Wolf, director of product

sustainability at [Seventh Generation](#), a consumer goods company that focuses on environmentally friendly products. The proliferation of state chemical laws is another driver.

## Supply chain hub

From Guardian Sustainable Business

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## What will it take to eliminate hazardous chemicals from everyday products?

Brands such as Burberry and Adidas have pledged to phase out dangerous chemicals, but face significant challenges

Leigh Stringer

theguardian.com, Tuesday 11 February 2014 13:57 EST



Model showing the periodic elements of chemistry. Photograph: Wellcome Images

When Burberry last month announced its plans to eliminate some chemicals of concern by July 2016, it's likely that few people outside of the sustainability community realized the ambitiousness of the goal and the timeline.

Phasing out potentially hazardous chemicals might sound simple, but is actually incredibly complicated, and sometimes costly, to accomplish, says Michelle Harvey, senior retail project manager at the Environmental Defense Fund (EDF). "If it was easy, everybody would have done it a long time ago," she says.

And as consumer awareness of potential chemical hazards has grown, more and more corporations are setting goals to phase them out.

## Retail Workgroup Activities

- Formation of Retailer Leadership Council
- Initiated project to pilot use of chemical assessment tools
- Retailer Webinars
- Updates to Retailer Portal (in progress)



# GC3 Retailer Leadership Council –convened December 2013

Founding members include:





# Retailer Leadership Council Mission

Promote safer chemicals, materials and products across retail supply chains.

The RLC will work together to identify at least one project annually to support the mission and will reach out to engage and inform other retailers.

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## Education Workgroup Activities

- Development of educational webinar matrix and “portal”
- Hosting of first four GC3 education webinars
- Work with MI Green Chemistry Clearinghouse on Green Chemistry Checklist
- Work with Washington Green Chemistry Center on curriculum collaboration



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**EDUCATION PORTAL**

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## GC3 Webinars

A full list of our webinars is shown in the table below. To search by your interests or job, use the pull-down menus below. You may make multiple choices in the pull-downs. Once you made your choices, the search results will be displayed in the table below. You may make new choices use the pull-down menus at any time.

Click on any highlighted webinar (in the first column) to learn more about the webinar and to view an archived version.

Audience/Interest  Topic/job

Topic Area/ Webinar Title	Target Audience	Short Description	Content areas
<b>Why Green Chemistry Should Be Mainstream</b>			
<a href="#">Why Do We Need Green Chemistry</a>	All Audiences		Green Chemistry, Sustainability, Innovation, Safety
<a href="#">The Value of Green Chemistry</a>	All Audiences	Green chemistry leaders discuss their efforts to build awareness and make a case within their firms, supply chains and customers on the value of green chemistry.	Green Chemistry, Drivers, Business case, Innovation
<a href="#">Green Chemistry Innovation ---Business case studies</a>			
<b>Green Chemistry and Green Engineering Foundations</b>			
<a href="#">The 12 Principles of Green Chemistry: Sustainability at the Molecular Level</a>	All Audiences	Green Chemistry pioneer John Warner provides an introduction to green chemistry and how it can be integrated into product design. This webinar also provides an overview of how chemical policy, toxicology and environmental health sciences, alternative assessment and green chemistry fit together.	Green Chemistry, Sustainability, Safety, Innovation
<a href="#">Introduction to Green Engineering</a>	Product Designers, Chemists, Bench Scientists, Process Engineers		Sustainability, Safety, Product Design
<a href="#">Tools/Metrics for Chemists</a>	Chemists, Product Designers, EHS, Process Engineers, Bench Scientists		Green Chemistry, Sustainability, Safety, Product Design

9th Annual



**Innovators Roundtable**

**MAY 28-30 2014**  
St. Paul, Minnesota

Hosted by **3M**



**GREEN CHEMISTRY &  
COMMERCE COUNCIL**

Moving Business Toward Safer Alternatives



IMAGE PROVIDED BY GC3 MEMBER SHAW INDUSTRIES

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## EDUCATION PORTAL

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### Chemistry Rating

1 (basically no chemistry) to  
5 (hardcore chemistry)



## GC3 Webinars

### Integrating Toxicity Information into Chemical Design

ORIGINAL WEBINAR DATE: MARCH 18, 2014

**Target Audience:** All industry sectors

**Topic/Job:** Chemists, Materials Developers, Designers, Toxicologists, EH&S

**Access the Archive:** [Audio and Slides, Slides Only](#)

#### Webinar Description

When chemists design new molecules for products, they don't immediately consider whether the chemicals will have toxic effects. Traditionally, this has been the responsibility of a toxicologist at a later stage of product development. If the chemist is told they cannot use a chemical, they frequently choose/design another chemical with similar function and structure to the original which often does not decrease the hazard. Rather than defaulting into a continual loop of measuring toxic effects after a product is created, chemists can start understanding how a change to the structure of a molecule can help avoid toxicity while achieving necessary properties and function. They can use predictive screening tools to start the process of designing inherently safer molecules.

The presenters provide an overview of molecular design tools and how they can be used to design safer products.

Anyone interested in scientific techniques for chemical and material R&D to integrate toxicity into chemical design should watch this webinar but depending on your background a prerequisite is recommended.

#### Learning Objectives

- Understand the importance of integrating toxicity into chemical design
- Learn about two examples for integrating toxicity into chemical design

#### Recommendations for Prerequisites

If you do not have a background in chemistry or toxicology, it is recommended that you review the following:

#### Webinar Listings

[Back to Search Tool](#)

#### Presenters



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Sustainability A to Z,  
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## The Green Chemistry Checklist

Green Chemistry and Safer Products Business Commitment, v.1.0



2014

## Why Green Chemistry?

### Inside

Why Use the Green Chemistry Checklist  
PAGE 2

The Checklist: Green Chemistry and Safer Products Business Commitment v.1.0  
PAGE 3

Pilot the Checklist  
PAGE 7

### The Business Case

Customers are increasingly expecting companies to show leadership in developing safer products to protect health and the environment. This creates a market opportunity for innovative companies that are able to bring safer chemicals and products to market.

A commitment to Green Chemistry and Engineering can help demonstrate that leadership. Green Chemistry is a key value proposition for business and can drive profits and regional economic development. Green Chemistry practices can mean cost savings in reduced energy and materials, and new sources of revenue in sustainable products with new performance characteristics. It can also reduce liabilities, like the generation of hazardous waste, by substituting safer chemicals.

**The Checklist was developed by the Michigan Green Chemistry Roundtable in cooperation with the Green Chemistry and Commerce Council, and builds on the GC3 Policy Statement on Green Chemistry.**

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**Innovators Roundtable**

**MAY 28-30 2014**

St. Paul, Minnesota

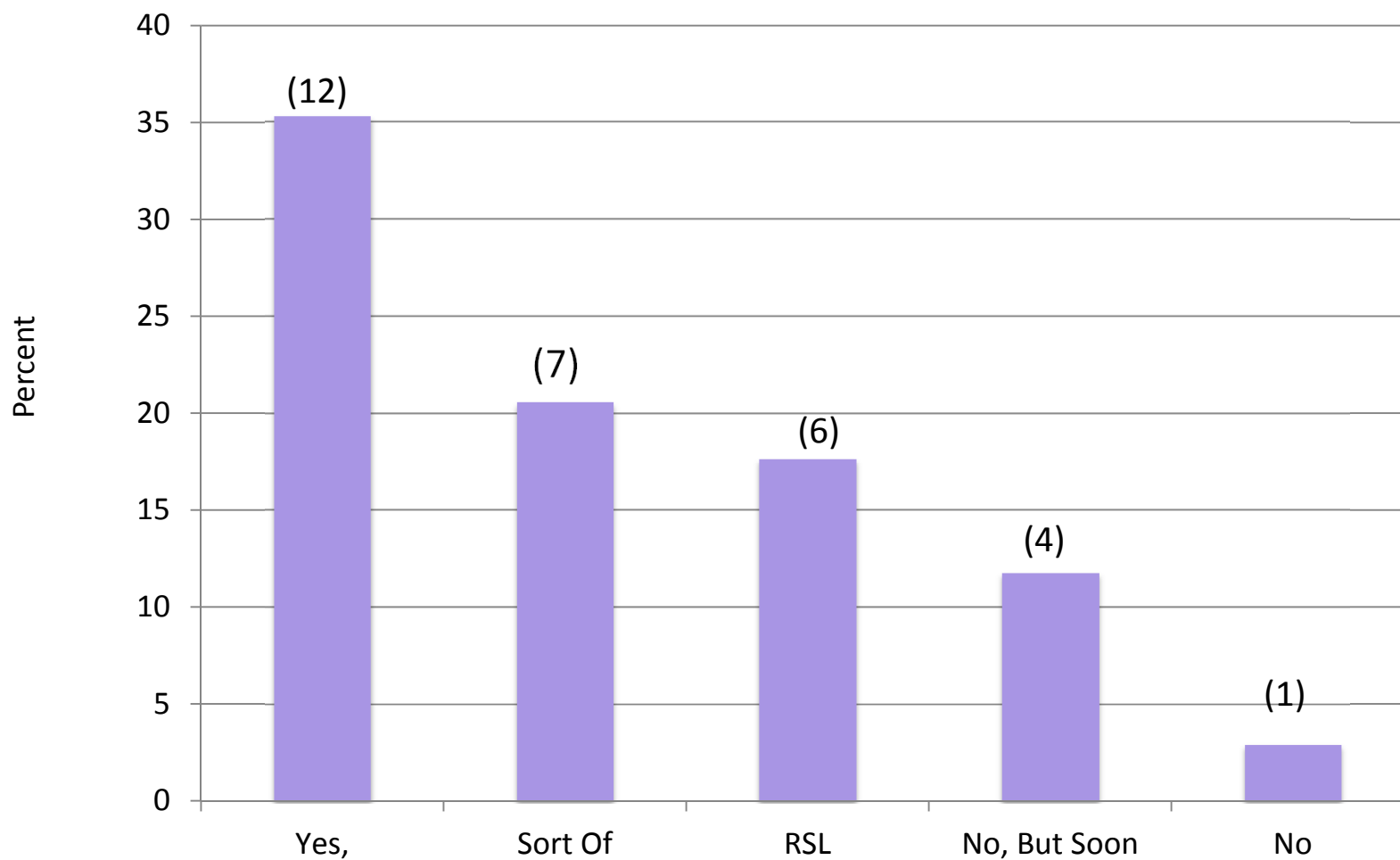
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# Mainstreaming Green Chemistry Project Group Activities

- GC3 Member Survey
- Establishment of project advisory committee and calls/discussions
- Discussions with key green chemistry actors about opportunities and outreach
- Mainstreaming Green Chemistry webinars

# Who Has A Formal Policy on Green Chemistry:

N= 32





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The Right Chemistry

**Timberland, Seventh Generation take green chemistry mainstream**

By **Monica Becker** and **Amy Perimutter**

Published January 10, 2014

Tags: [Bio-based Products](#), [Chemicals](#), [More...](#)

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Since 2005, a group of chemical companies, brands, retailers, bio-based startups, government agencies and NGOs have worked to advance green chemistry practices in their organizations and more broadly, in the economy.

Now 10 organizations from the Green Chemistry & Commerce Council (GC3), including Timberland, Valspar and Seventh Generation, will spearhead a one-year collaborative project aimed at bringing green chemistry into the mainstream.

The development follows the growing awareness of green chemistry, the design, manufacture and application of chemical products that reduce or

eliminate the use and generation of hazardous substances. Segetis, a small bio-based chemical manufacturer, for example, has introduced a solvent made from waste wood trimmings and corn stalks that is now used to power Seventh Generation and Method cleaning products, delivering performance previously unheard of in green cleaning.

Cargill, meanwhile, won a 2013 Presidential Green Chemistry Award for developing a vegetable oil-based transformer fluid that is much less toxic and flammable, and provides superior performance compared to mineral oil-based fluids, with a lower carbon footprint.

But while such developments show progress, green chemistry still remains a marginal consideration in chemicals research, education and product design, GC3 members concluded at their 2012 annual meeting. With relatively little government support or investment, and few academic programs that teach or research in the field, green chemistry has not achieved the status of clean energy or managed to secure the kinds of longer-term investment we've seen for renewable energy technologies.

**Competitive advantage**

Green chemistry provides industries with incredible opportunity for growth and competitive advantage, as there is a



EDITOR'S CHOICE



**The McDonough Conversations: Why nature needs humans**

Joel Makower

Monarch butterflies are dwindling. Humans can rectify that. [Read more](#)

**GreenBiz 101: What do you need to know about demand response?**  
**Cisco and Amsterdam's plan to make a green city smart**

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# Green Chemistry Innovation Project Group Activities

- Webinars on Green Chemistry Innovation
- Research on Green Chemistry Innovation models
- Outreach and dialog with innovation group
- Development of model GC3 Green Chemistry Innovation Portal: A “Match.com” for green chemistry innovation






**Non-Bisphenol A can linings**

This category will hold discussions, articles etc. on the topic of non-Bisphenol A can linings. There are subcategories for specific materials.

	<b>Acrylics</b> This topic area contains discussions, articles, etc. on acrylio-based can lining materials	1 Topics	0 Replies	Last Post: Article: No Clear by <b>test</b> 5 days 1 hour ago
	<b>Polyester resins</b> This topic area contains discussions, articles on polyester resin can linings	0 Topics	0 Replies	
	<b>Vinyl</b> This topic area contains discussions, articles on vinyl resin can linings	0 Topics	0 Replies	
	<b>Additives</b> This topic area contains discussions, articles, etc. on additives for can linings	0 Topics	0 Replies	

**Alts to perfluorinated water & oil repellents for textiles**

This category will hold discussions, articles etc. on the topic of alternatives to perfluorinated water, oil, stain repellents. There are subcategories for specific technologies.

	<b>Paraffins</b>	0 Topics	0 Replies	
	<b>Dendrimers</b>	1	0	Last Post: Seeking perform by <b>test</b>
	<b>Silicone</b>			

Forum > Alts to perfluorinated water & oil repellents for textiles > Dendrimers



**Topics in Category: Dendrimers**

**Paint Strippers**

This category contains posts, articles, etc. on p

0 Replies		<b>Seeking performance test results</b> Topic started 1 week 6 days ago by <b>test</b>	11 Views	Last Post by <b>test</b> 1 week 6 days ago
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## The Right Chemistry

### How crowdsourcing can boost green chemistry

By **Monica Becker**

Published February 07, 2014

Tags: Green Chemistry & Toxics

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Crowdsourced or Challenge Driven Innovation (CDI) is a way to create new markets and solve problems quickly and cost effectively by harnessing diverse and creative on-demand talent outside one's own organization.

CDI is typically used to complement in-house innovation programs. A number of companies have launched in the decade to provide platforms and services to assist companies, government agencies and nonprofits in running CDI projects.

As part of its effort to mainstream green chemistry, the manufacturers, brands and retailers in the Green Chemistry & Commerce Council (GCC3) has explored

CDI and other new innovation models and programs that can be used to accelerate green chemistry. The GCC3 took a close look at InnoCentive, given its successful track record in the green chemistry space. Here's what we learned.

Launched in 2001, InnoCentive offers a set of finely tuned products and services used by companies, government agencies and nonprofits to ramp up their innovation programs. InnoCentive's online platform hosts technical challenges that they broadcast out to their own network of 300,000 problem solvers, also known as InnoCentive's Global Solver Community. Through its new partnerships with Nature and Scientific American, the company can reach an even larger community. These solvers compete to provide novel ideas and solutions in exchange for a monetary award for the solution selected by the challenge sponsor. Anyone can view live challenges on InnoCentive's website.

InnoCentive has hosted a number of green chemistry challenges, including:

- Chemical synthesis routes that avoid toxic chemicals
- Non-toxic solvents for specialty applications, such as art restoration
- Safe reagents for commercial chemical processes
- Green polymers for food, medicine and construction
- A method to bond electrical components to glass without the use of lead



#### EDITOR'S CHOICE



**The McDonough Conversations: Why nature needs humans**

Joel Makower

Monarch butterflies are dwindling. Humans can rectify that. [Read more](#)

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## Facilitating Chemical Data Flow Along Supply Chains Project Group Activities

- Development of model GC3 Framework for Managing CBI in B2B Chemical Data Requests
- Follow up discussions with project group

## GC3 Framework for Managing CBI in B2B Chemical Data Requests



Issues/questions that concern company depend on factors such as

- Supply chain position
- Industry sector
- Product chemical intensity
- Analytic capabilities
- Company/supplier relationship

# 1) What purpose does company have for type & detail of chemical data requested from supplier?



Reason for company information request	Type/detail of information requested from supplier			
	Hazardous ingredients- human health (hazard statement only-> full disclosure CAS/%/function)	All ingredients/materials (checklists -> full composition, residuals, contaminants)	Process	Business information (e.g., suppliers & customers)
Regulations (state, national, international)				
Standards & certifications (e.g., IFRA, BIFMA, DfE, Cradle-to-Cradle, LEED)				
Customer data requirements				
Company goals: <ul style="list-style-type: none"> <li>• product-design sustainability</li> <li>• Efficient response to changing regulations, requirements</li> <li>• Product branding (hazard-free, bio-based, full transparency)</li> </ul>				

## What's on the horizon

- Increased attention to safer chemical ingredient transparency and substitution of chemicals of concern – both in marketplace and policy
- Increased availability of data
- Increased attention to bio-based chemicals industry – innovation at small start-ups
- Increasing collaboration between stakeholder groups on solutions and innovation
- Increased funding for R&D?

BUSINESS DAY

143 COMMENTS

## The 'No More Tears' Shampoo, Now With No Formaldehyde

By KATIE THOMAS JAN. 17, 2014



Johnson & Johnson's decision to reformulate its baby products is the first step in an effort to remove an array of increasingly unpopular chemicals from its personal care products. Learn Podfile for The New York Times



SKILLMAN, N.J. — The only hint that something is different inside millions of bottles of Johnson's Baby Shampoo arriving on store shelves are two words: "Improved Formula."

The shampoo has the same amber hue, the same sudsy lather and — perhaps most important — the same familiar smell that, for generations of Americans, still conjures memories of childhood bath time.

What's different about the shampoo, and 100 other baby products sold by Johnson & Johnson, isn't so much about what's been added; it's what's missing. The products no longer contain two potentially harmful chemicals, formaldehyde and 1,4-dioxane, that have come under increasing scrutiny by consumers and environmental groups.

In response to consumer pressure two years ago, the company pledged to remove both chemicals from its baby products by the end of 2013, and this month, it said that it had met that goal. The reformulated products are making their way to store shelves around the world and will replace existing products over the next several months.



## ChemView

Use this database to get information on chemical health and safety data received by EPA and EPA's assessments and regulatory actions for specific chemicals under the Toxic Substances Control Act (TSCA). ChemView contains no confidential business information (CBI).

If you do not receive results for a particular chemical, it does not mean EPA does not have information on that chemical; the data may not be posted yet but will be available in the future as EPA continues to populate the database.

- [Learn more and find additional information about EPA's efforts to manage existing chemicals](#)
- [Read the ChemView User's Guide and Web Service Information](#)
- [Please give us your feedback so we can continuously improve ChemView](#)

Data last updated on 4/18/2014

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## Industrial biotechnology: Chemical building blocks from renewable resources



Holmgren: Having a positive impact.

Chemical majors are collaborating with biotechnology companies to develop chemicals derived from renewable feedstocks. Most activity is still at the development stage with only a small number of chemicals, such as 1,3-propanediol and lactic acid, being produced at industrial scale. Biobased succinic acid is the latest chemical from renewable feedstocks that is being produced on a larger scale.

The global market for renewable chemicals is anticipated to grow from \$3.6 billion today to over \$12 billion by 2020, according to Rennovia (Menlo Park, CA), which is targeting production of a suite of chemical products from renewable feedstocks.

There continues to be demand for products derived from renewable raw materials, such as biobased polyethylene from consumer products companies such as Coca-Cola, Danone, and Procter & Gamble. There is a lot of activity in developing new routes to conventional chemicals using renewable materials such as biomass, agricultural, and forest waste. Nevertheless, with a few exceptions, biobased chemicals have not yet made it into the big time to compete with petrochemical counterparts. Some of the exceptions are specialty fine chemicals, such as citric acid and amino acids. The most prominent biobased chemicals include 1,3-propanediol and lactic acid, which are 100% and 99% biobased, respectively, according to IHS Chemical data. In contrast, about 12% of global epichlorohydrin and about 8% of propylene glycol productions are biobased. Both substances are derived from glycerin, a by-product of biodiesel production.

Commercial prospects for biobased chemicals depends on a number of factors, including feedstock costs, scale, available technology, voluntary corporate environmental initiatives, and greenhouse gas (GHG) emission regulations, says Marifaith Hackett, senior manager at IHS Chemical. Cradle-to-gate analyses show biobased chemicals have lower GHG emissions—and in some cases are GHG negative—resulting in removal or permanent storage of GHG. Such analyses are, however, feedstock- and process-specific, and other environmental impacts, such as land use, water demand, and eutrophication, may be significant, Hackett adds.

There are no clear-cut advantages or disadvantages to using fossil-based or renewable raw materials per se, BASF says. It is best to decide on a case-by-case basis, taking environmental concerns, cost effectiveness, and social impact over the entire product life cycle into account. BASF's ecoefficiency analysis has shown that biobased plastics are not always more ecoefficient than their petrochemical-based counterparts. If relatively little water and fertilizer are required and transportation routes are short, using plant-based raw materials can be best. But if a large amount of energy is needed to process the materials, beneficial effects can be reversed. BASF used about 3% renewable raw materials for its production in 2012. "Customers in the electronic and automotive industries will not pay a premium for biobased products unless there is a technical advantage," says Matthias Scheibitz, specialist R&D/product development at BASF automotive.



A product will be sustainable if it meets economic, environmental, and social drivers, "the three pillars of sustainability," says Jennifer Holmgren, CEO at LanzaTech (Roselle, IL). "Our drivers are to reduce the carbon footprint; to make low-carbon fuels, but do it from feedstocks that don't negatively impact society or are perhaps [even] beneficial for society; not negatively impacting food, land, water, but positively impacting [them]," she says.

DSM says its investments in the biobased economy are viewed as a medium-to-long-term opportunity, created by the necessary transition from the current fossil-based system toward one that is biobased.

# Enter our Open Space for innovation

## We're looking for brilliant ideas ... and solutions

At AkzoNobel, we are proud of what we have achieved and we're proud of the vast reservoir of knowledge and know-how that we've built up – but we also recognize that no one company or individual has all of best ideas and that successful companies forge resilient partnerships to complement their strengths and fill knowledge and technology gaps. That's why we're looking for the best ideas to help us tackle future challenges – no matter whether they are our own or someone else's. We believe in the nearly boundless capacity of the human mind, and that by tapping into that capacity we stand a much better chance of achieving our own ambitions – and yours.

## Can we work together?

If you've got a proven idea that is connected in some way to our work, tell us about it. If you are involved in an ongoing project with great promise that complements our own products, processes, projects and technologies, let us know. If you have ideas about sustainable technologies that can help us to achieve our ambitions to deliver sustainable solutions to our customers, please consider sharing them with us. We want to work with you to turn your vision into a reality – for our mutual benefit. That's what this site is all about, and it's what our Open Space initiative is all about. If you'd like to learn about what open innovation means to us, see how we've established winning

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## The National Science Foundation's Investment in Sustainable Chemistry, Engineering, and Materials

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**ABSTRACT:** In 2012, the National Science Foundation (NSF) created a new cross-directorate initiative—Sustainable Chemistry, Engineering, and Materials (SusCHEM)—within its Science, Engineering, and Education for Sustainability (SEES) portfolio. SusCHEM aims to support the discovery of new science and engineering that will provide humanity with a safe, stable, and sustainable supply of chemicals and materials sufficient to meet future global demand. While NSF has historically supported research in this area, the SusCHEM effort elevates this interest to a priority. In particular, NSF will support the discovery of new science and engineering that will (1) improve the harvesting and processing of natural resources, (2) develop replacement and substitute chemicals and materials for those that are scarce, toxic, and/or expensive, (3) extend the lifetime of materials through improved durability, (4) reduce energy consumption through improved catalysis, and (5) discover low-energy means of recycling, repurposing, recovering, and reusing chemicals and materials. This article provides an overview of the sustainability challenges that the mathematical, physical, and geological science and engineering communities are well positioned to address and presents the National Science Foundation's vision of the SusCHEM initiative.

**KEYWORDS:** Catalysis; Durability; Energy reduction; Natural resources; Recycle; Repurpose; Recover; Reuse; Substitution



From the freshwater we use to shower to the petroleum-derived gasoline that runs our cars and the indium tin oxide in our smartphone screens, our daily lives depend on a stable and affordable supply of natural resources. Given the increasing demand for many key natural resources and the possibility of volatility in their supply, there is a pressing need to discover new basic science and engineering to facilitate sustainable development.

United States demand for natural resources was described succinctly in a 2008 report of the National Research Council:<sup>1</sup>

*Every year more than 25,000 pounds of new useful materials must be provided for each person in the United States to make the items that we use every day. [T]he extent or function of common items such as cellular telephones, computers, automobiles, toothpaste, paint, or a stable electrical supply could not be possible without useful materials or mineral products and related materials.*

When this demand is scaled to the global level, maintaining the current balance of supply and demand over the coming decades becomes even more challenging and urgent. Projections estimate that the human population will grow from 7 billion currently to 9–10 billion by midcentury. Even

more importantly, the “wadd middle class,” a term coined by Goldman Sachs that refers to those who will have the spending power to consume a significant amount of resources and commodities, may swell from 1.5 billion at present to 4 billion by 2050.<sup>2,3</sup> If these predictions are realized, it will tremendously strain humanity's ability to extract and refine sufficient natural resources from the planet to meet ever-increasing global demand. The United States, as the world leader in science and technology, is well positioned to take on this challenge and to reap the economic and national security benefits of secure, stable, and environmentally benign supply chains.

In 2010, the National Science Foundation (NSF) created the Science, Engineering, and Education for Sustainability (SEES) initiative to support the discovery of new knowledge to help solve global issues in this realm. In particular, SEES promotes an integrated and interdisciplinary approach to address sustainability challenges, involving social, economic, and

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# GC3 2014 Innovators Roundtable: Overall Desired Outcomes

- Promote sharing of information and networking to advance green chemistry development and adoption across sectors
- Understand critical challenges to the development and application of green chemistry across supply chains
- Identify and advance dialogue on key enablers of green chemistry that the GC3 can promote through its Mainstreaming Agenda
- Receive critical input to finalize the GC3 Mainstreaming Green Chemistry Agenda and identify key objectives for the coming year

# Core questions for each session

- What is the opportunity here?
- What were/are key drivers – what was driving the effort/initiative?
- What has helped or hindered you?
- What would be helpful to you to advance GC (policies, education, partnerships)?
- What is the potential role of the GC3? How do we position GC3 as a key force in advancing GC?

# Logistics

- Agenda
- Receptions
- Staff/Advisory Committee
- Advisory Committee Nominations
- Evaluations
- Videography

# GC3 Advisory Committee

- Mary Grim, Timberland
- John Frazier, Nike
- Barbara Hanley, Hewlett Packard
- Bob Israel, Valspar
- Al Iannuzzi, Johnson & Johnson
- Rich Liroff, Investor Environmental Health Network
- Roger McFadden, Staples
- Ken Zarker, Washington State Department of Ecology

## Ground Rules

- Respectful, honest dialogue and listening
- Please keep electronic device use to a minimum
- Chatham House Rule: Participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed.



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